

## CLAIMS

What is claimed is:

- 5           1.       A surface imprint composition comprising a matrix material defining imprint cavities of a template molecule wherein a substantial fraction of the imprint cavities are localized at or near the surface of the matrix material.
2.       The surface imprint of Claim 1 in which the matrix material comprises a  
10 polymer.
3.       The surface imprint of Claim 2, wherein the polymer comprises a polymerized monomer selected from the group consisting of styrene, methyl methacrylate, 2-hydroxyethyl methacrylate, 2-hydroxyethyl acrylate, methyl acrylate, acrylamide, vinyl  
15 ether, vinyl acetate, divinylbenzene, ethylene glycol dimethacrylate, ethylene glycol diacrylate, pentaerythritol dimethacrylate, pentaerythritol diacrylate, N,N'-methylenebisacrylamide, N,N'-ethylenebisacrylamide, N,N'-(1,2-dihydroxyethylene)bis-acrylamide, trimethylolpropane trimethacrylate and vinyl cyclodextrin.
- 20           4.       The surface imprint of Claim 1 in which the matrix material comprises a heat-sensitive compound.
5.       The surface imprint of Claim 4, wherein the heat-sensitive compound is  
25 selected from the group consisting of hydrogels, agarose, gelatins and moldable plastics.
6.       The surface imprint composition of Claim 1, wherein the template molecule corresponds to a portion of a macromolecule of interest.
- 30           7.       The surface imprint composition of Claim 6 further including the macromolecule bound at an imprint cavity.
8.       The surface imprint composition of Claim 6, wherein the template molecule corresponds to a terminal portion of the macromolecule.

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9. The surface imprint composition of Claim 6, wherein the macromolecule is a polynucleotide and the template molecule is an oligonucleotide.

10. The surface imprint composition of Claim 6, wherein the macromolecule is a polypeptide and the template molecule is an oligosaccharide.

11. The surface imprint composition of Claim 6, wherein the macromolecule is a polypeptide and the template molecule is a peptide.

12. The surface imprint composition of Claim 10, wherein the sequence of the peptide corresponds to a contiguous sequence of the polypeptide.

13. The surface imprint composition of Claim 11, wherein the peptide is between 3 and 15 amino acids in length.

14. The surface imprint composition of Claim 11, wherein the peptide is between 4 and 15 amino acids in length.

15. The surface imprint composition of Claim 11, wherein the peptide is between 4 and 7 amino acids in length.

16. The surface imprint composition of Claim 11, wherein the portion of the polypeptide comprises the C-terminus of the polypeptide.

17. The surface imprint composition of Claim 1 in which the matrix material defines imprint cavities of at least two different template molecules.

18. The surface imprint composition of Claim 17 in which at least one of the template molecules corresponds to a portion of a macromolecule.

19. The surface imprint composition of Claim 17 in which cavities are arranged in a spatially identifiable array.

20. A plurality of surface imprint compositions according to Claim 1.

21. The plurality of surface imprint compositions of Claim 20 in which each surface imprint composition of the plurality is unique.

22. The plurality of surface imprint compositions of Claim 20 in which each surface imprint composition comprises a plurality of different cavities.

23. The plurality of surface imprints of Claim 20 which are arranged in a spatially identifiable array.

24. The array of Claim 23 which is one-dimensional.

25. The array of Claim 23 which is two-dimensional.

26. The array of Claim 23 which is three-dimensional.

27. A surface imprint composition comprising a matrix material defining imprint cavities of a template molecule wherein a substantial fraction of the imprint cavities are oriented.

28. A method of preparing a surface imprint comprising the steps of:

(a) forming a hardened matrix in the presence of an immobilized template molecule; and

(b) removing the template molecule from the hardened matrix, yielding a surface imprint.

29. The method of Claim 28 wherein the matrix comprises a heat sensitive compound.

30. The method of Claim 28 wherein the matrix comprises a polymer.

31. The method of Claim 28 in which the immobilization is by way of covalent attachment.

32. The method of Claim 28 in which the template molecule is immobilized via a linker molecule.

33. The method of Claim 28 in which the template molecule is immobilized on a solid support selected from the group consisting of glass, plastic and acrylic.

34. The method of Claim 28 in which the immobilized template molecule corresponds to a portion of the macromolecule of interest.

35. A method of making a surface imprint comprising the steps of:

(a) dispersing a polymerizable compound and a conjugate molecule in a solvent system which comprises a first solvent and a second solvent which is immiscible with the first solvent such that they form a two-phase system wherein the polymerizable compound and the template moiety of the conjugate molecule partition into the same phase of the two-phase system;

(b) polymerizing the polymerizable compound; and

(c) removing the conjugate molecule.

36. The method of Claim 35 in which the template moiety and the tail moiety are linked via a linker.

37. The method of Claim 35 in which the tail moiety is hydrophobic and the template moiety is hydrophilic.

38. The method of Claim 35 in which the tail moiety is hydrophilic and the template moiety is hydrophobic.

39. The method of Claim 35 wherein the tail moiety comprises a lipid or palmitic acid.

40. The method of Claim 35 in which the conjugate is immobilized on a solid support.

41. The method of Claim 40 in which the immobilization is by way of covalent attachment.

42. The method of Claim 41 in which the covalent attachment is via a linker  
5 molecule.

43. The method of Claim 40 in which the tail moiety is covalently attached to the solid support.

10 44. The method of Claim 43 in which the covalent attachment is via a linker.

45. The method of Claim 43 in which the solid support is selected from the group consisting of glass, plastic and acrylic.

15 46. A method of capturing a molecule, comprising contacting the molecule with a surface imprint composition according to Claim 1 under conditions in which the molecule binds the surface imprint.

20 47. A method of capturing a macromolecule with a surface imprint composition according to Claim 6.

48. A method of isolating a molecule, comprising the steps of:

- (a) capturing the molecule according to Claim 46; and
- (b) recovering the molecule from the imprint.

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49. A method of capturing a plurality of molecules, comprising contacting the plurality of molecules with a surface imprint composition according to Claim 17, under conditions in which the molecules bind their corresponding surface imprint cavities.

30 50. A method of capturing a plurality of molecules, comprising contacting the plurality of molecules with a plurality of surface imprint compositions according to Claim 20, under conditions in which the molecules bind their corresponding surface imprints.

35 51. A method of quantifying the amount of a molecule in a sample, comprising the steps of:

- (a) capturing the molecule according to Claim 46; and
- (b) quantifying the amount of the molecule bound to the surface imprint.

52. The method of Claim 51, in which the amount of the molecule is quantified  
5 by fluorescence, resistance, capacitance, acoustic wave, or surface plasmon resonance.

53. A method of quantifying the relative amounts of a plurality of molecules in a sample, comprising the steps of:

- (a) capturing the plurality of molecules according to Claim 49 or 50;
- 10 (b) quantifying the amount of each molecule of the plurality bound to the plurality of surface imprints.

54. The method of Claim 53, in which the amount of a molecule is quantified by fluorescence, resistance, capacitance, acoustic wave, or surface plasmon resonance.

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55. A method of making an surface imprint array capable of capturing a plurality of different molecules, comprising the steps of:

- (a) forming a hardened matrix in the presence of an array of immobilized template molecules; and
- 20 (b) removing at least two of the template molecules from the hardened matrix yielding a surface imprint array.

56. A method of screening a plurality of macromolecules, comprising contacting the plurality of macromolecules with a matrix, said matrix comprising an surface imprint of  
25 a template molecule wherein the template molecule is selected from a peptide consisting of 3 to 30 amino acids, a polynucleotide consisting of 3 to 30 nucleotides, and an oligosaccharide consisting of 3 to 30 saccharides, under conditions in which at least one molecule of the plurality binds the matrix.

30 57. A method of screening a plurality of macromolecules, comprising contacting the plurality of macromolecules with a plurality of matrices, said matrices comprising a plurality of surface imprints of template molecules, wherein at least two of the template molecules are unique, wherein the template molecules are selected from a peptide consisting of 3 to 30 amino acids, a polynucleotide consisting of 3 to 30 nucleotides, and an

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oligosaccharide consisting of 3 to 30 saccharides, and under conditions in which at least one molecule of the plurality binds a matrix.

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